

Claim Or Claims

We claim:

- 1 A method for making a mesoporous metal carbonate structure comprising the steps of:
 - 5 a. providing a solution containing a non-ionic surfactant and a metal salt having an organic counter ion,
 - b. adding sufficient base to react with the acidic byproducts to be formed by the addition of carbon dioxide, and
 - 10 c. adding carbon dioxide, thereby forming a mesoporous metal carbonate structure containing the metal from said metal salt.
- 2 The method of **Claim 1** further comprising the step of selecting said metal as an alkaline earth metal.
- 3 The method of **Claim 2** further comprising the step of selecting said alkaline earth metal from the group consisting of Be, Mg, Ca, Sr, Ba, and Ra.
- 15 4 The method of **Claim 1** further comprising the step of selecting said metal as a transition metal.
- 5 The method of **Claim 4** further comprising the step of selecting said transition metal from the group consisting of Ni, Ti, and Zn.
- 6 The method of **Claim 1** further comprising the step of selecting said metal as an alkali metal.
- 20 7 The method of **Claim 6** further comprising the step of selecting said alkali metal as Li.
- 8 The method of **Claim 1** further comprising the step of removing any residual non-ionic surfactant and organic counter ion by exposing the mesoporous metal carbonate structure to a solvent.
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- 9 The method of **Claim 8** further comprising the step of removing any residual non-ionic surfactant and organic counter ion by exposing the mesoporous metal carbonate structure to a solvent selected as supercritical carbon dioxide.
- 10 A mesoporous metal carbonate structure having pores between about 1
5 nanometer and about 150 nanometers.
- 11 The mesoporous metal carbonate structure of **Claim 10** wherein said metal is selected as an alkaline earth metal.
- 12 The mesoporous metal carbonate structure of **Claim 11** wherein said alkaline earth metal is selected from the group consisting of Be, Mg, Ca, Sr, Ba, and
10 Ra.
- 13 The mesoporous metal carbonate structure of **Claim 10** wherein said metal is selected as a transition metal.
- 14 The mesoporous metal carbonate structure of **Claim 13** wherein said transition metal is selected from the group consisting of Ni, Ti, and Zn.
- 15 15 The mesoporous metal carbonate structure of **Claim 10** wherein said metal is selected as an alkali metal.
- 16 The mesoporous metal carbonate structure of **Claim 15** wherein said alkali metal is selected as Li.
- 17 A method for making a mesoporous metal carbonate structure comprising the
20 steps of:
- a. providing a solution containing a non-ionic surfactant and a calcium acetate salt,
 - b. adding sufficient base to react with the acidic byproducts to be formed by the addition of carbon dioxide, and
 - 25 c. adding carbon dioxide, thereby forming a mesoporous metal carbonate structure containing the metal from said metal salt.

- 18 The method of **Claim 17** further comprising the step of selecting said metal as an alkaline earth metal.
- 19 The method of **Claim 18** further comprising the step of selecting said alkaline earth metal from the group consisting of Be, Mg, Ca, Sr, Ba, and Ra.
- 5 20 The method of **Claim 17** further comprising the step of selecting said metal as a transition metal.
- 21 The method of **Claim 20** further comprising the step of selecting said transition metal from the group consisting of Ni, Ti, and Zn.
- 22 The method of **Claim 17** further comprising the step of selecting said metal as an alkali metal.
- 10 23 The method of **Claim 22** further comprising the step of selecting said alkali metal as Li.
- 24 The method of **Claim 17** further comprising the step of removing any residual non-ionic surfactant and organic counter ion by exposing the mesoporous metal carbonate structure to a solvent.
- 15 25 The method of **Claim 24** further comprising the step of removing any residual non-ionic surfactant and organic counter ion by exposing the mesoporous metal carbonate structure to a solvent selected as supercritical carbon dioxide.

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